Evaluating 11 Years of Quantitative Precipitation Forecast (QPF) Performance for Extreme Events

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(Credit: Dave Gatley/FEMA)

FLOODED
COUNTY OF

Motivation

Many key end-users of QPFs require accurate forecasts (e.g., location, timing, and amount of precipitation) of extreme precipitation events.

(Credit: Associated Press)

Objective

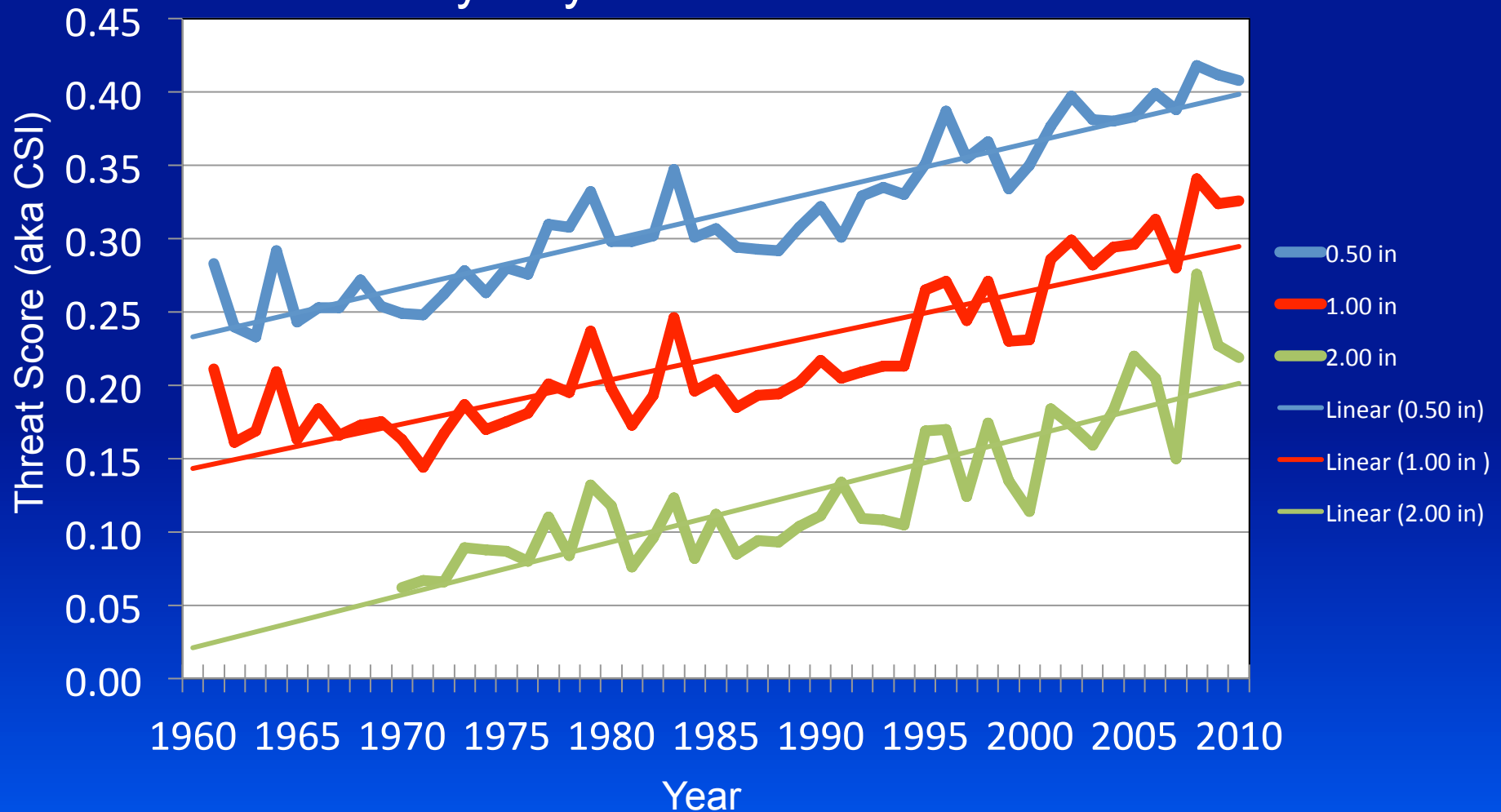To define and baseline performance of extreme precipitation events from 2001 to 2011.

Context

Hydrometeorological Testbed (HMT) activities at both ESRL/PSD and NCEP/HPC have led to the development of this work.

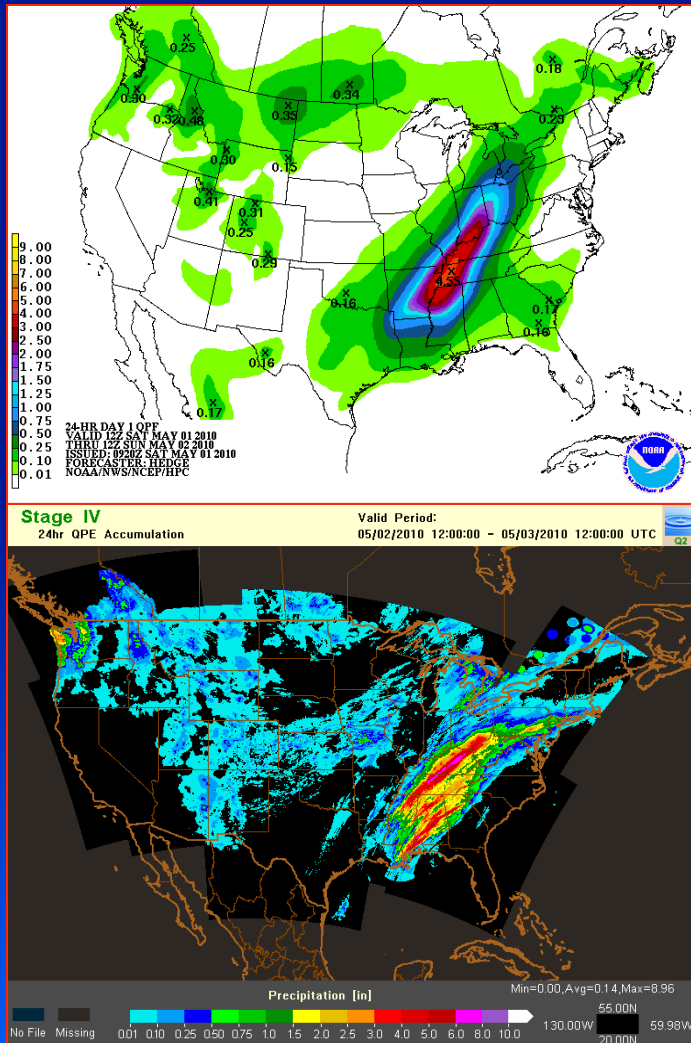(Credit: Kevork Djansezian/Getty Images)

How are QPFs monitored?

Yearly Day-1 HPC Threat Scores

NOAA QPF Government Performance and Results Act measure is based on Day-1 (24 h) 1.0 inch 24 h^{-1} threshold

Forecast and Evaluation Data

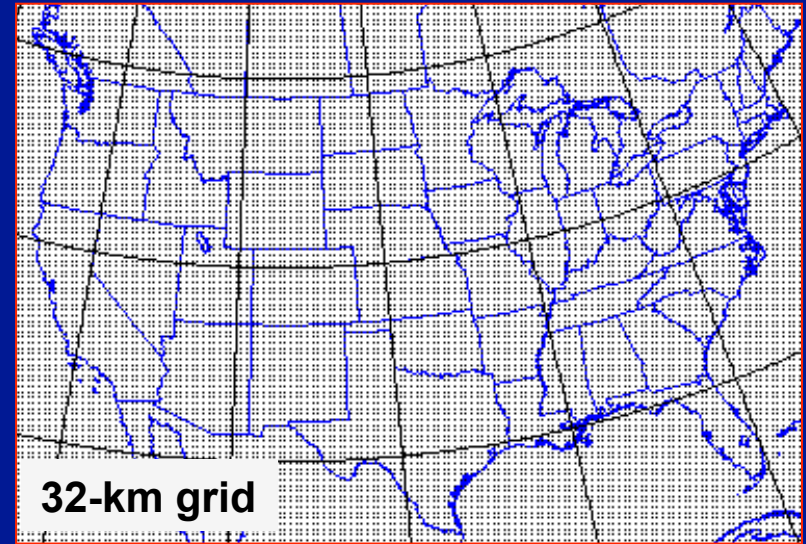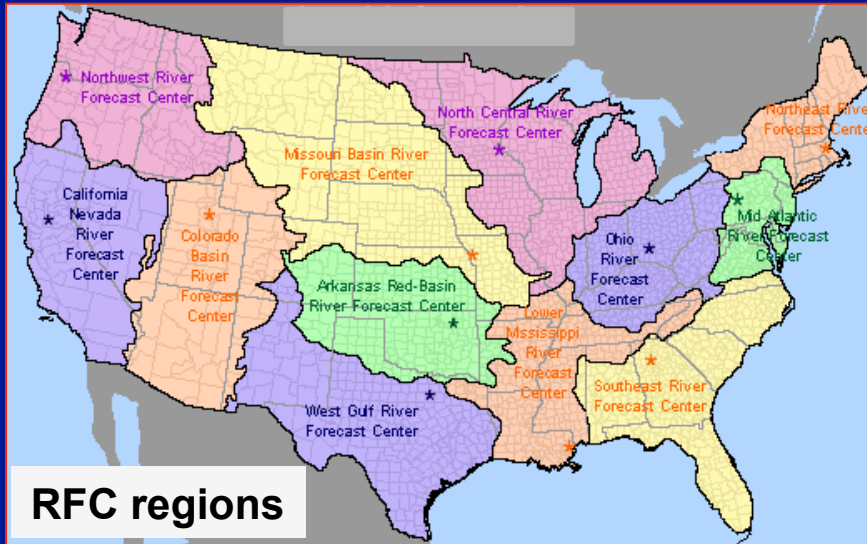## Evaluation Period: 1 January 2001 - 31 December 2011

HPC CONUS QPFs

- Obtained from the NPVU
- Resolution of 32-km
- Forecasts made from 12 Z to 12 Z
- Day 1 (24 h), Day 2 (48 h), and Day 3 (72 h)

RFC Quantitative Precipitation Estimates (QPE)

- Obtained from the NPVU
- Stage IV data
- Resolution of 32-km (upscaled from 4-km)
- Accumulated precipitation from 12 Z to 12 Z

Methodology

RFC regions

32-km grid

Defining Extreme Events

- Find all wet days at each 32-km grid point within the RFC region
- Calculate the 99th and 99.9th percentile thresholds (i.e., top 1.0% and 0.1% of events)
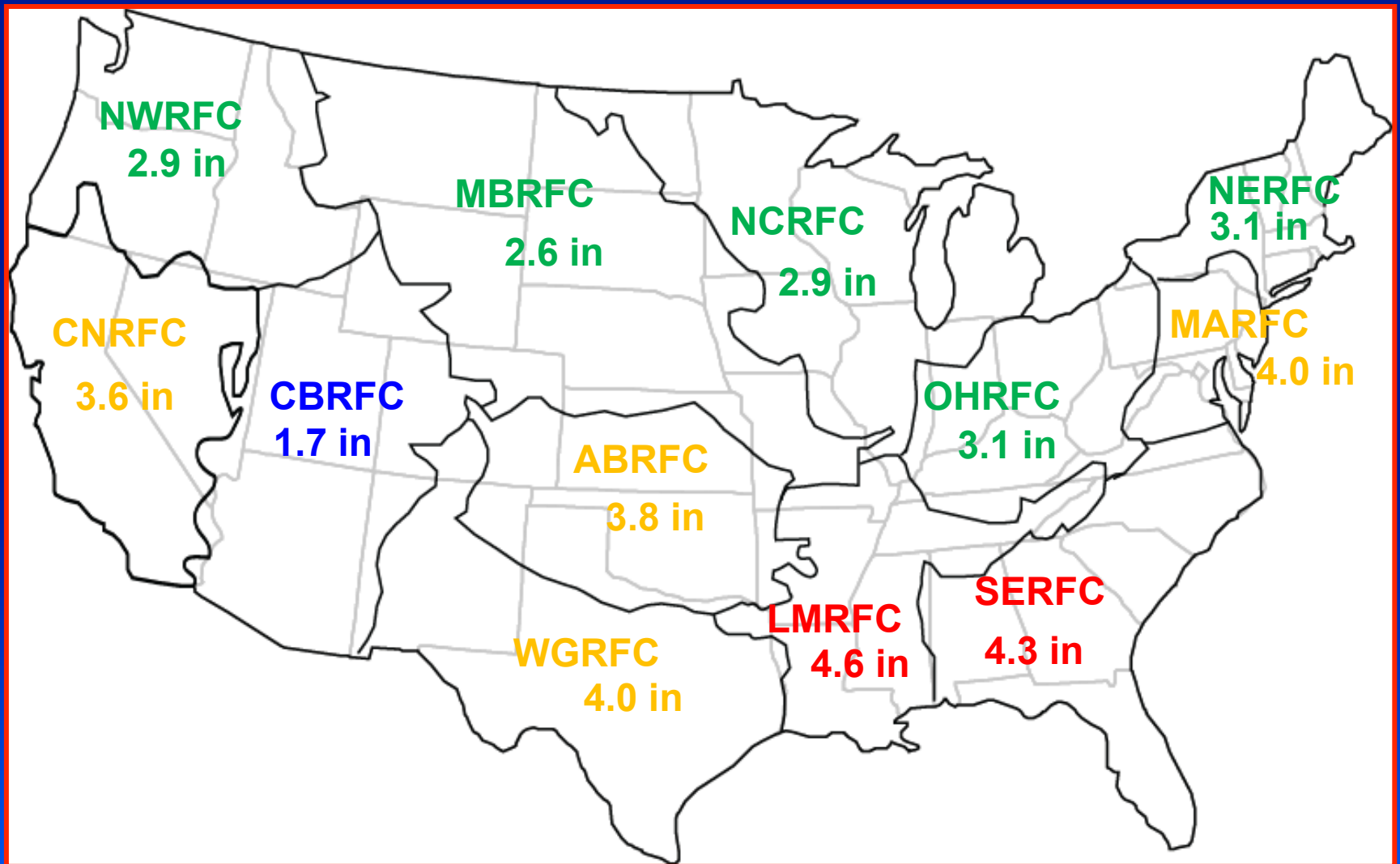
Analysis

- Calculate POD, FAR, CSI, MAE, and bias per Ralph et al. (2010) using Developmental Testbed Center (DTC) Model Evaluation Tools (MET) software.
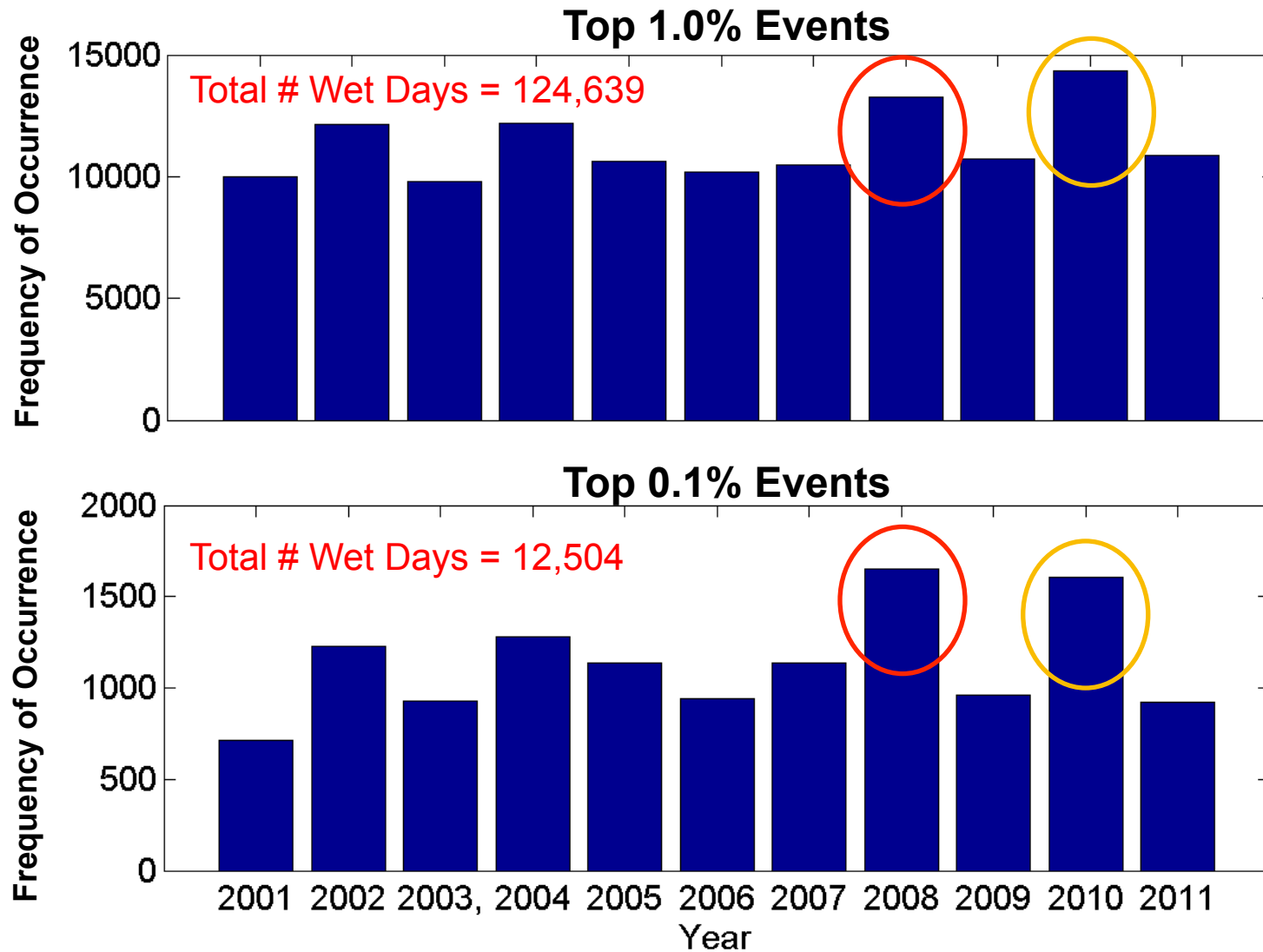- Compare to GPRA threshold of 1.0 in 24 h^{-1}
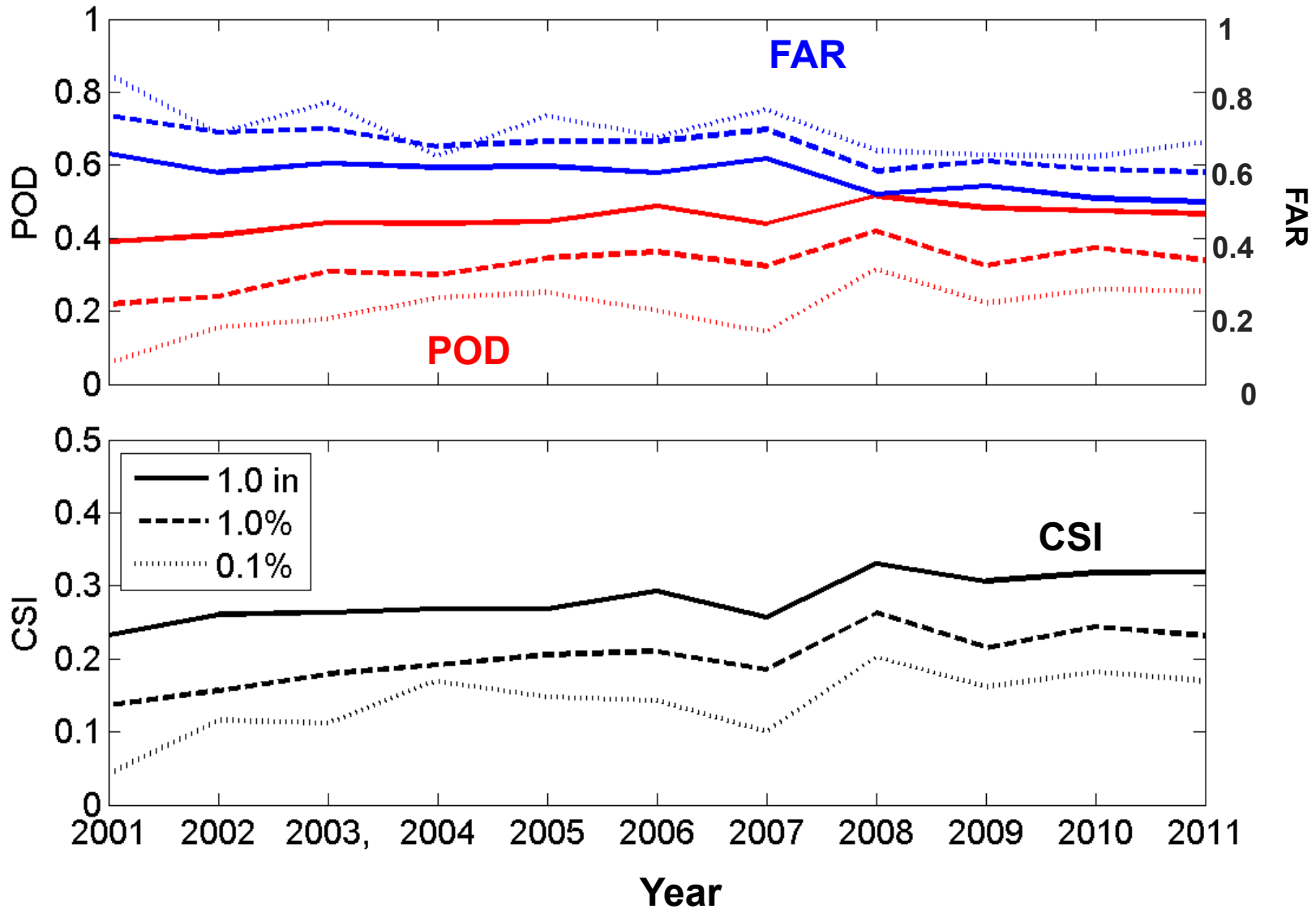
Regional top 1.0% precipitation thresholds
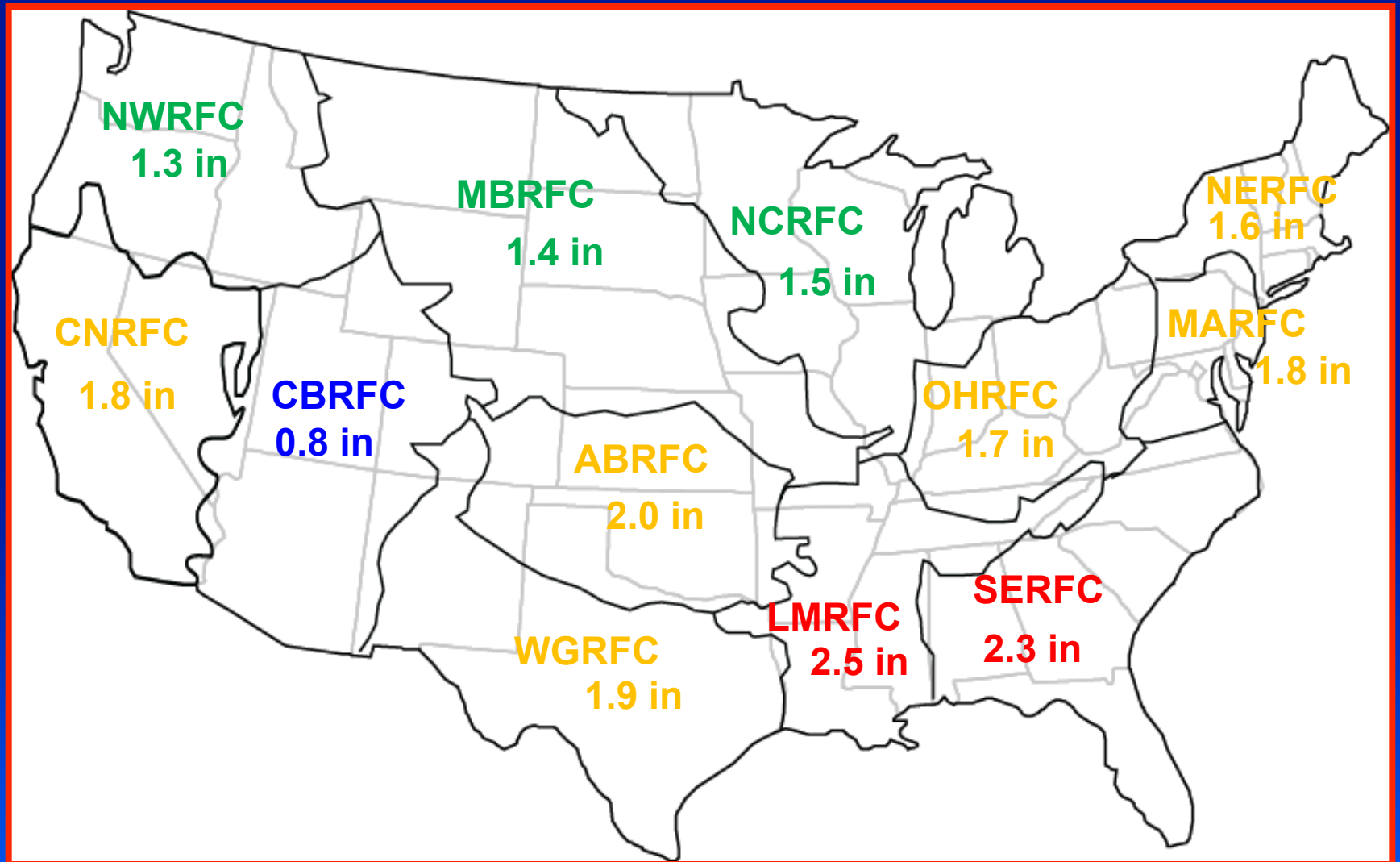
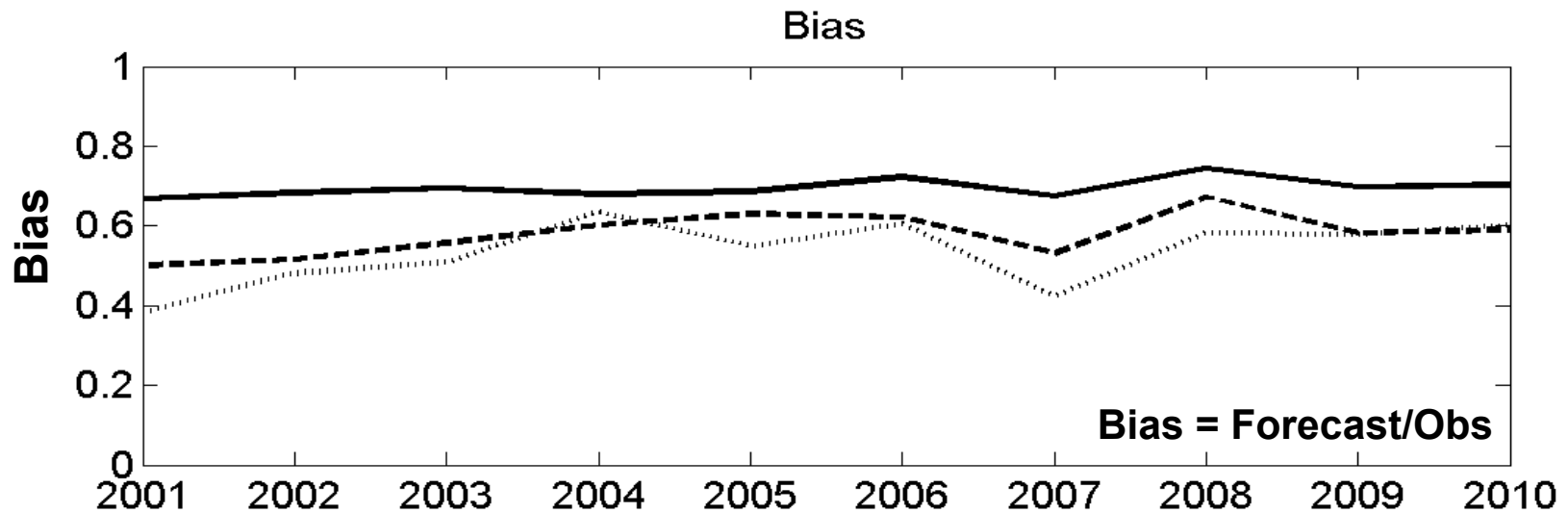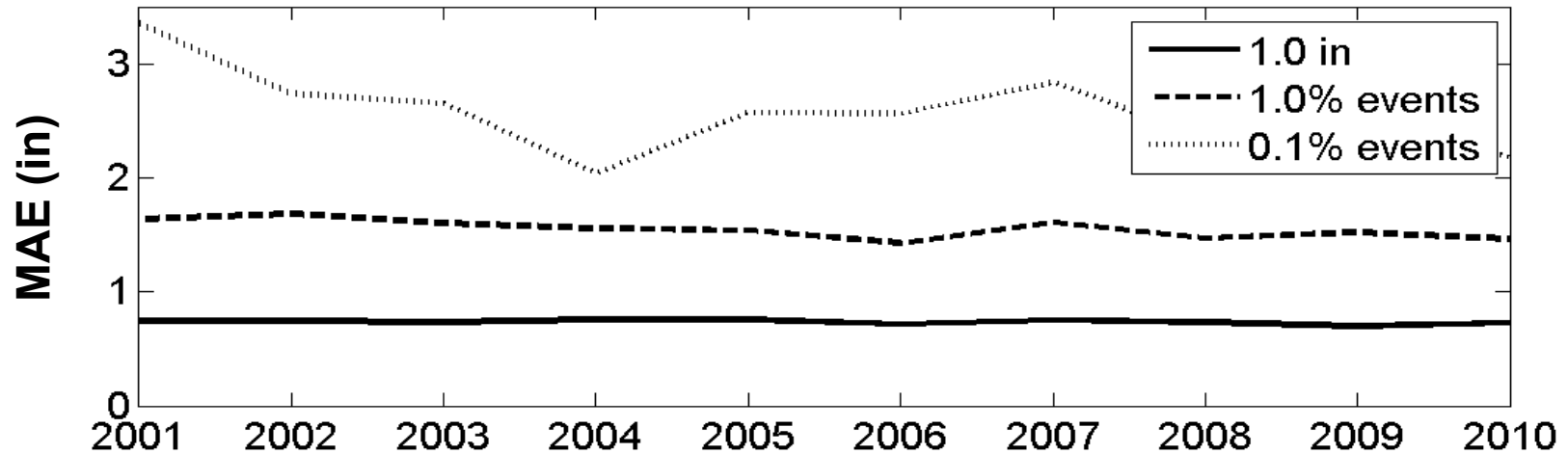# Regional top 0.1% precipitation thresholds
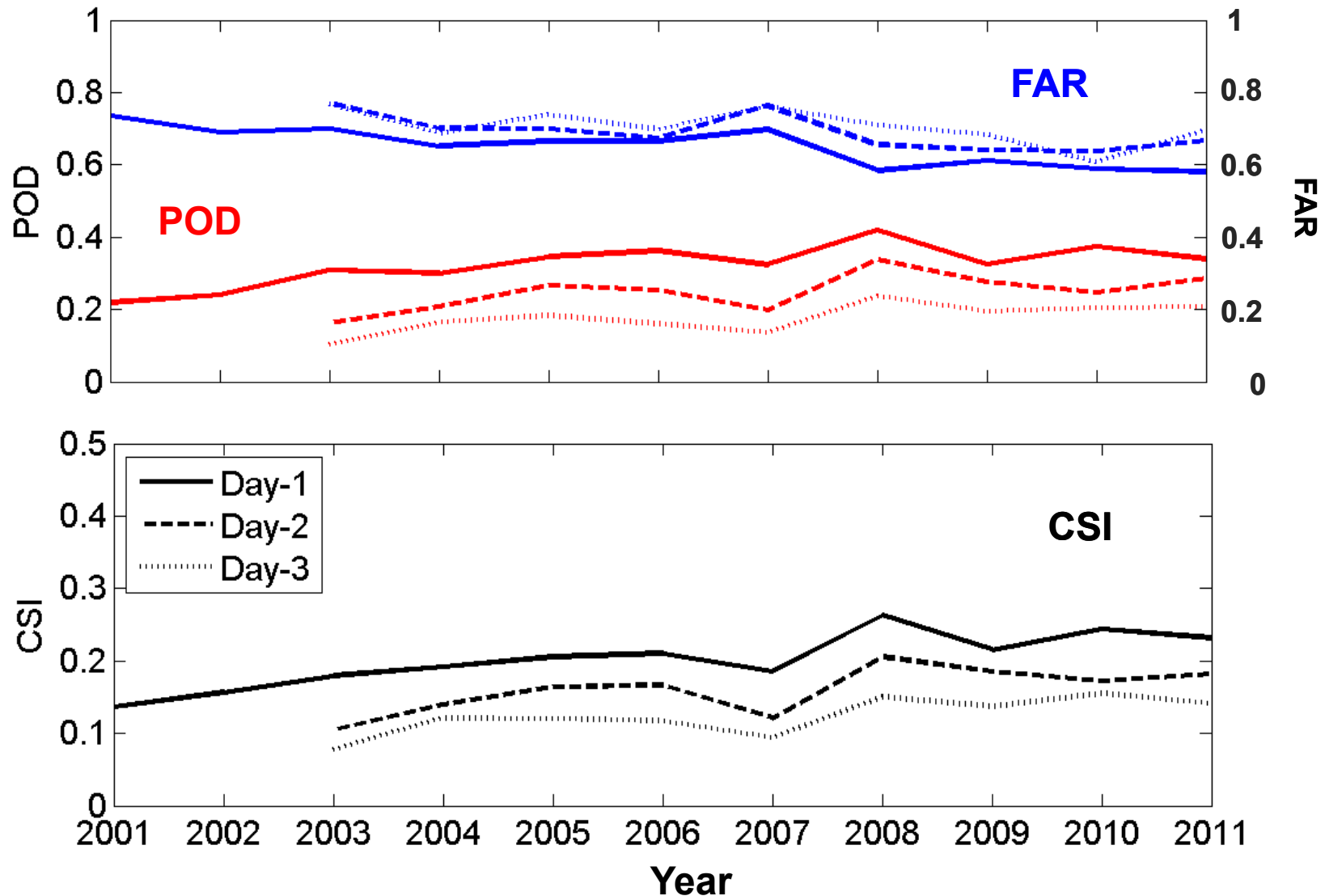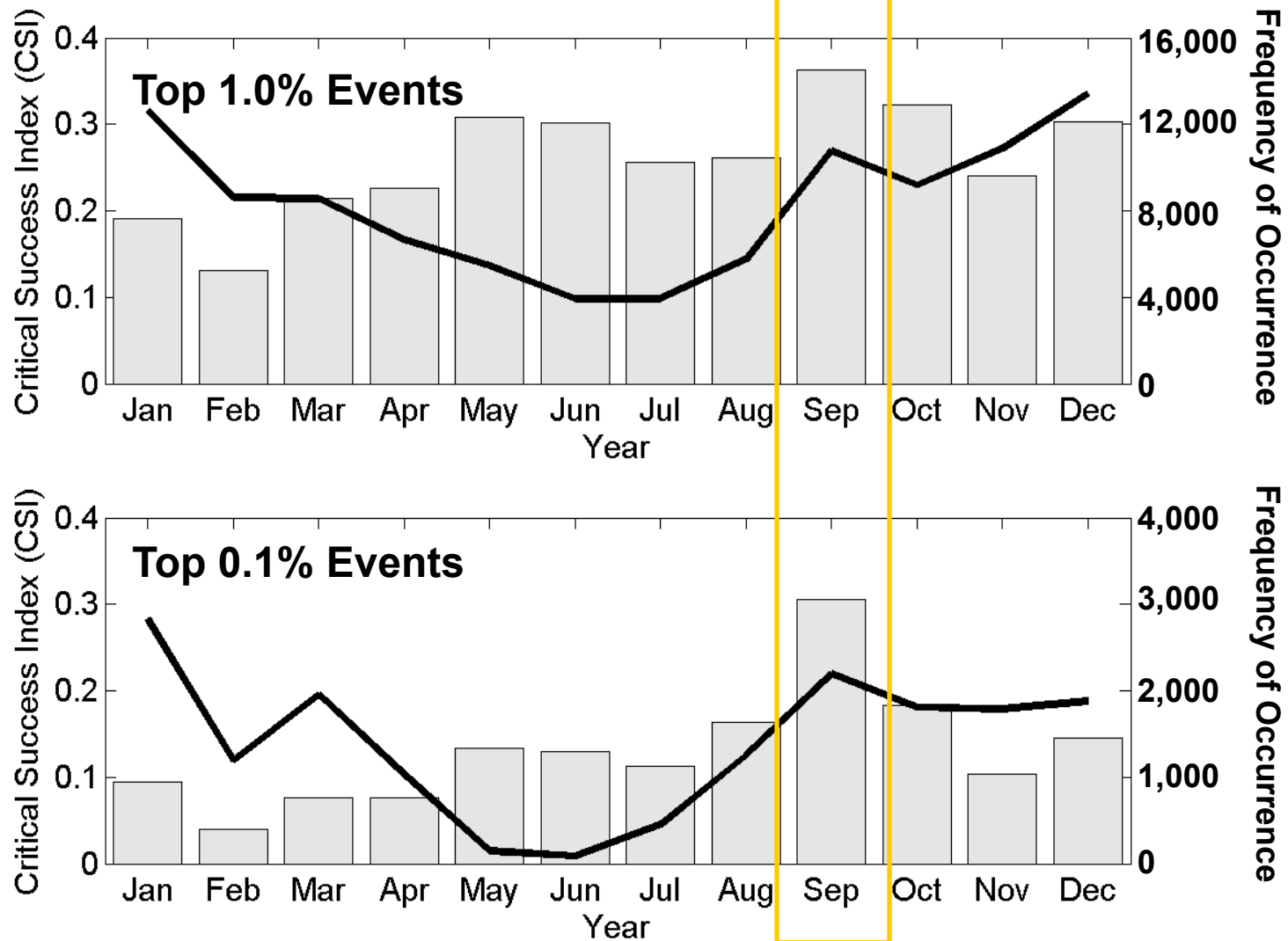
Event Sampling
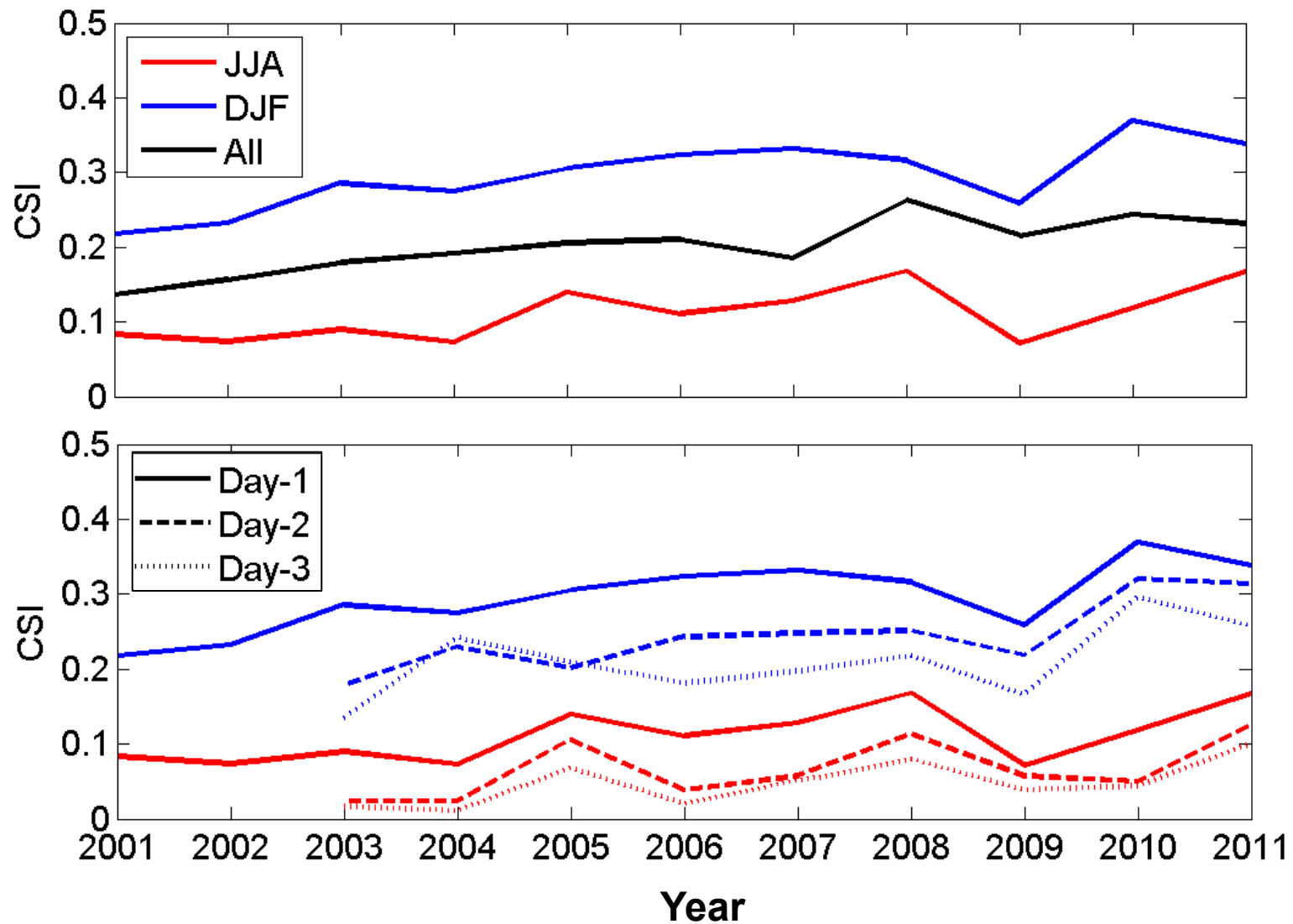
Extreme QPF Performance

Mean Absolute Error and Bias

Top 1.0% Events by Lead Time

Extreme Events by Season

Top 1.0% Events

Top 0.1% Events

Top 1.0% Events by Season and Lead Time

Summary

- QPF performance was baselined over 11 years (2001-2011) for extreme precipitation events.

- Regional extreme precipitation thresholds (1.0% and 0.1%) were determined for each RFC region for the specific QPE dataset.

- Five measures were used to assess extreme QPF performance (POD , FAR, CSI, bias and MAE).

  - Extreme precipitation performance has been improving since 2001.

  - Longer lead times have lower performance values.

  - Cool season outperforms warm season.

Thank you